Schemes and Syllabus

(For academic session 2022-2023)

M. Tech (Part Time)
(Computer Science & Engineering)

IEC School of Engineering

Atal Shiksha Nagar (Kallujhanda), P.O.
Mandhala, Village- Nanakpura,
Pinjore-Nalagarh highway, District- Solan,
Himachal Pradesh- 174103

www.iecuniversity.com

Table of Content

SECTION 1

Program Outcomes and Program Specific Outcomes

Program Outcomes

PO1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to the solution of complex engineering problems.

PO2 Problem analysis: Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural and engineering sciences.

PO3 Design/development of solutions: Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 Conduct investigations of complex problems: Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice**.**

PO9 Individual and team work: Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

PO10 Communication: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.

PO11 Project management and finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

PO12 Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes

PSO1: An effective skill set while demonstrating through programming and analytical skills.

PSO2: Productivity in the relevant field while professionally even in diverse environment succeeding.

PSO3: An ability to identify /develop/design solutions for Industry/Society Problems through their coding, database and networking skills

PSO4: Ability to absorb and adopt the ever changing advance Technology in the field of Computer Science & Engineering.

Section 2:

IEC University, Baddi

SCHEME OF STUDY & EVALUATION FOR

M. TECH. PROGRAM FIRST YEAR (PART TIME)

SEMESTER I

Course			Periods			Evaluation Scheme					Course Total	
Sr. No	Course Code	Title	L	T	P	Sessional				Exam	Marks	Credits
						MSE	CA	P	Total	ESE		
(Theory)												
1	MTCSE(PT)-101	Software Engineering Concepts & Methodologies	4	0	0	40	20	0	60	40	100	4
2	MTCSE(PT)-102	Advanced DBMS	4	0	0	40	20	0	60	40	100	4
3	MTCSE(PT)-103	Parallel and distributed computing	4	0	0	40	20	0	60	40	100	4
(Practical/Training/Project)												
1	MTCSE(PT)-151	Advanced DBMS Lab	0	0	2			30	30	20	50	1
Total			**12**	**0**	**2**	**120**	**60**	**30**	**210**	**140**	**350**	**13**

IEC University, Baddi

SCHEME OF STUDY & EVALUATION FOR

M. TECH. PROGRAM FIRST YEAR (PART TIME)

SEMESTER II

Course			Periods			Evaluation Scheme					Course Total	
Sr. No	Course Code	Title	L	T	P	Sessional				Exam	Marks	Credits
						MSE	CA	P	Total	ESE		
(Theory)												
1	MTCSE(PT)-201	Advanced Data Structures and algorithms	4	0	0	40	20	0	60	40	100	4
2	MTCSE(PT)-202	Advanced Computer Architecture	4	0	0	40	20	0	60	40	100	4
3	MTCSE(PT)-203	Advanced Operating System	4	0	0	40	20	0	60	40	100	4
(Practical/Training/Project)												
1	MTCSE(PT)-251	Advanced Data Structures and algorithms Lab	0	0	2			30	30	20	50	1
Total			**12**	**0**	**2**	**120**	**60**	**30**	**210**	**140**	**350**	**13**

IEC University, Baddi

SCHEME OF STUDY & EVALUATION FOR

M. TECH. PROGRAM SECOND YEAR (PART TIME)

SEMESTER III

Course			Periods			Evaluation Scheme					Course Total	
Sr. No	Course Code	Subject	L	T	P	Sessional				Exam	Marks	Credits
						MSE	CA	P	Total	ESE		
(Theory)												
1	MTCSE (PT)-301	Software Verification, Validation & Testing	4	0	0	40	20	0	60	40	100	4
2	MTCSE (PT)-302	Wireless Networks	4	0	0	40	20	0	60	40	100	4
3	MTCSE (PT)-303	Soft Computing	4	0	0	40	20	0	60	40	100	4
(Practical/Training/Project)												
1	MTCSE (PT)-351	Software Verification, Validation & Testing Lab	0	0	2			30	30	20	50	1
Total			**12**	**0**	**2**	**120**	**60**	**30**	**210**	**140**	**350**	**13**

SCHEME OF STUDY & EVALUATION FOR

M. TECH. PROGRAM SECOND YEAR (PART TIME)

SEMESTER IV

Course			Periods			Evaluation Scheme					Course Total	
Sr. No	Course Code	Subject	L	T	P	Sessional				Exam	Marks	Credits
						MSE	CA	P	Total	ESE		
(Theory)												
1	MTCSE (PT)-401	Research Methodology	4	0	0	40	20	0	60	40	100	4
2	MTCSE (PT)-402	Cryptography: Network Security	4	0	0	40	20	0	60	40	100	4
3	MTCSE (PT)-403	Artificial Intelligence	4	0	0	40	20	0	60	40	100	4
(Practical/Training/Project)												
1	MTCSE (PT)-452	Artificial Intelligence Lab	0	0	2			30	30	20	50	1
Total			**12**	**0**	**2**	**120**	**60**	**30**	**210**	**140**	**350**	**13**

SCHEME OF STUDY & EVALUATION FOR

M. TECH. PROGRAM THIRD YEAR (PART TIME)

SEMESTER V

Course			Periods			Evaluation Scheme					Course Total	
Sr. No	Course Code	Subject	L	T	P	Sessional				Exam	Marks	Credits
						MSE	CA	P	Total	ESE		
(Practical/Training/Project)												
1	MTCSE (PT)-551	Seminar	0	0	4			50	50	-	50	2
2	MTCSE (PT)-552	Dissertation Phase-I	0	0	-			120	120	80	200	6
Total			**0**	**0**	**4**	**-**	**-**	**170**	**170**	**80**	**250**	**8**

IEC University, Baddi

SCHEME OF STUDY & EVALUATION FOR

M. TECH. PROGRAM THIRD YEAR (PART TIME)

SEMESTER VI

Semester IV											Marks	Credits
1	MTCSE(PT)--651	Dissertation Phase-II	0	0	-			300		200	500	20
Total			**0**	**0**	**-**			**300**		**200**	**500**	**20**

COMPONENTS OF EVALUATION

The components of Evaluation for each course will be as under:

For Non-Practical Subjects:

(a) Continuous Assessment (CA), -- 20 Marks in the form of:
  (i) Assignments (15 Marks)
  (ii) Attendance (05 Marks),

(b) Mid-Term Exams (MSE), ---------40 Marks
  (i) First MSE to be held after completion of 35% - 40% course coverage,
  (ii) Second MSE to be held after completion of 70% - 80% course coverage

(c) End- semester Exams (ESE), ------ 40 Marks

For Practical Subjects:

(a) Continuous Assessment (CA), -- 15 Marks in the form of:
  (i) Assignments (10 Marks)
  (ii) Attendance (05 Marks),

(b) Mid-Term Exams (MSE), ---------30 Marks
  (i) First MSE to be held after completion of 35% - 40% course coverage,
  (ii) Second MSE to be held after completion of 70% - 80% course coverage

(c) End- semester Exams (ESE), ------ 30 Marks

(d) Practical(Internal-15,External-10)---- 25 Marks

1st Year

I Semester

Program: M.Tech CSE					**Semester:** I		
Course Title: Software Engineering Concepts & Methodologies					**Course Code:** MTCSE(PT)-101		
L	**T**	**P**	CH	**CP**	**Int. A**	**ESE**	**Total**
4	-	-	4	4	60	40	100

Course Description: Successful software development depends on an in-depth understanding of how the phases and supporting activities of the software development life cycle work together. Each phase of the life cycle contributes to a reliable, maintainable product that satisfies user requirements. The application of good engineering practices throughout the cycle dramatically improves the likelihood of delivering a quality software project on time, in scope and within budget. While there are many rigorous methodologies, in fact most approaches and tools have a mixture of strengths and weaknesses. Traditional development approaches result in models that are incomplete and quickly become out of-sync with the application source code. Many modeling approaches focus on describing software designs, rather than solving business problems.

Course Outcomes

CO1: Analyze software requirements and process models required to develop a software system.
CO2: Design and develop a quality software product using design engineering principles and Develop software product as per user and societal requirements.
CO3: Follow standards for software development and quality management.
CO4: Demonstrate skills in applying risk and quality management principles for effective management of software projects.

Theory **4 Hrs/Week**

Unit	Topic	Hours
1	**Principles and Motivations:** History; definitions; why engineered approach to software development; Software development process models from the points of view of technical development and project management: waterfall, rapid prototyping, incremental development, spiral models, Agile Software Development, Emphasis on computer-assisted environments. Selection of appropriate development process.	15
2	**Software Development Methods:** Formal, semi-formal and informal methods; Requirements elicitation, requirements specification; Data, function, and event-based modeling; Some of the popular methodologies such as Yourdons SAD, SSADM etc; CASE tools-classification, features, strengths and weaknesses; ICASE; CASE standards. **Software Project Management**: Principles of software projects management; Organizational and team structure; Project planning; Project initiation and Project termination; Technical, quality, and management plans; Project control; Cost estimation methods: Function points and COCOMO.	20
3	**Software Quality Management:** Quality control, quality assurance and quality standards with emphasis on ISO 9000; Functions of software QA organization does in a project; interactions with developers; Quality plans, quality assurance towards quality improvement; Role of independent verification & validation; Total quality management; SEI maturity model; Software metrics.	10
4	**Configuration Management:** Need for configuration management; Configuration management functions and activities; Configuration management	15

	techniques; Examples and case studies. **Software Testing Fundamentals:** Basic Terminology, Testing Techniques and strategies. Brief introduction to various standards related to Software Engineering.	

Recommended Books:

1. Pressman, Roger, Software Engineering - A Practitioners Approach, McGraw Hill (2008) 6th ed.
2. Sommerville, Ian, Software Engineering, Addison-Wesley Publishing Company, (2006) 8th ed.
3. Peter, James F., Software Engineering - An Engineering Approach, John Wiley (2004).
4. Jalote, Pankaj, An integrated Approach to Software Engineering, Narosa (2005).

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2	-	-	-	-	-	3	-	-	-	1	1	-	2	1
CO2	1	-		1	-	1	-	-	-	-	1	-	1	-	-	1
CO3	-	3	-	2	1	-	-	1	-	-	2	2	-	2	-	1
CO4	3	2	1	2	2	-	1	-	-	-	-	-	-	-	1	1

Program: M.Tech CSE					**Semester:** I		
Course Title: Advanced DBMS					**Course Code:** MTCSE(PT)-102		
L	**T**	**P**	**CH**	**CP**	**Int. A**	**ESE**	**Total**
4	-	-	4	4	60	40	100

Course Description: The course presupposes a basic knowledge of conceptual modelling for data base systems and implementation using relational DBMS and SQL. The course aims to a more profound understanding of database theories, models, and methods and an ability to use these in different situations.

Course Outcomes:

CO1: Identify the basic concepts and various data model used in database design ER modelling concepts and architecture use and design queries using SQL.

CO2: Apply relational database theory and be able to describe relational algebra expression, tuple and domain relation expression fro queries.

CO3: Recognize and identify the use of normalization and functional dependency, indexing and hashing technique used in database design.

CO4: Apply and relate the concept of transaction, concurrency control and recovery in database.

Theory **4 Hrs/Week**

Unit	Topic	Hours
1	**Relational Data Base Design and Architecture:** DBMS Architecture, Data base models, Normal Forms Based on Primary Keys, (1NF, 2NF, 3NF & BCNF), Lossless Join and Dependency Preserving Decomposition. Multivalued and Join Dependencies, Template Dependency, Inclusion and Generalized Functional Dependency. **SQL**–A Relational Database Language, Data Definition in SQL, View and Queries in SQL, Specifying Constraints ,Indexes, Triggers in SQL.	20
2	**Concurrency control & Recovery:** Transaction Concept and State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, **Concurrency Control Techniques**, Lock-Based Protocols, Timestamp-based Protocols, Validation – based Protocols, Multiversion Schemes, Deadlock Handling, **Recovery System**, Failure Classification, Storage Structure, Recovery and Atomicity, Log-based Recovery, Shadow Paging, Recovery with Concurrent Transactions.	15
3	**Distributed Data Bases:** Distributed database concept, An over view of Client/Server Architecture, Database security, issues, GIS, Mobile databases, overview of Object oriented database & temporal databases.	10
4	**Data Warehousing & Data mining:** The Evolution of Data Warehousing, Today's Development Environment, Types of Data and their Uses, Conceptual Data Architecture, Design Techniques, Logical Architecture. **Data Mining:** Introduction, data mining, kind of data, Functionalities, interesting patterns, Classification of data mining systems, Major issues.	15

	Data Warehouse and OLAP Technology for Data Mining: data warehouse, operational database systems and data warehouses, Architecture, Implementation, development of data cube technology.	

Recommended Books:

1. Korth, Silberschatz, Database System Concepts , 4th Ed., TMH, 2000.
2. Date C. J., An Introduction to Database Systems , 7th Ed., Narosa Publishing, 2004
3. Data Mining, Adriaans, Addison-Wesley Longman.
4. Alex Berson, Stephen Smith, Korth Theorling, Data Mining, TMH.
5. Anahory, Addison-Wesley Longman, Data Warehousing in the Real World

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	-	3	-	1	-	2	1	2	-	-	2	1	-	3	-
CO2	1	2	1	3	1	1	-	-	-	-	-	-	-	1	-	-
CO3	-	-	-	-	-	-	2	3	-	-	1	-	2	2	-	3
CO4	2	-	1	-	2	1	2	2	-	2	3	2	-	-	1	1

Program: M.Tech CSE					**Semester:** I		
Course Title: Parallel and distributed computing					**Course Code:** MTCSE(PT)-103		
L	**T**	**P**	**CH**	**CP**	**Int. A**	**ESE**	**Total**
4	-	-	4	4	60	40	100

Course Description: The objective of this course is to introduce the fundamentals of parallel and distributed processing, including system architecture, programming model, and performance analysis. It will focus on the basic architectural, programming, and algorithmic concepts in the design and implementation of parallel and distributed applications. The specific topics include, but not limited to, multithreaded programming, message passing interface, GPU, and cloud computing.

Course Outcomes:

CO1: Understand the requirements for programming parallel systems and how they can be used to facilitate the programming of concurrent systems.
CO2: To learn and apply knowledge of parallel and distributed computing techniques and methodologies.
CO3: To learn the architecture and parallel programming in graphics processing units (GPUs).
CO4: Understand the memory hierarchy and cost-performance tradeoffs.

Theory **4Hrs/Week**

Unit	Topic	Hours
1	**Introduction**: Scope and issues of parallel and distributed computing. **Models Of Parallel Computing**: Taxonomy of parallel structures, Control mechanism, Address-Space Organization, Interconnection connection networks: Static and Dynamic interconnection networks, evaluating static interconnection networks, embedding other networks (Linear Array, Mesh, Binary Tree) into a hypercube; Routing mechanisms for static interconnection networks: Store and Forward (SF) Routing; Cut - Theory (CT) Routing; Cost-Performance trade-off; Architectural Models for Parallel Algorithm design.	20
2	**Basic Communication Operation**: Simple message transfer between two processors; One-to-all broadcast; All-to-all broadcast; Reduction and prefix sums; One-to-all personalized communication; All-to-all personalized communication; circular shift. **Performance And Scalability Of Parallel Systems**: Performance matrices for Parallel systems: Run time, Speed up, Efficiency and Cost; The effect of granularity and data mapping on performance; Scalability of parallel systems; Iso-efficiency metric of scalability;	15
3	**Models Of Distributed Computing**: Mini computer model; Workstation pool model; Client-server model; Pool of processors model; Hybrid model.	10

	Networking And Internetworking: Network technologies and Protocols.	
4	**Inter process Communication And Remote Procedure Calling**: Building blocks; Client-server communication; group communication; Case study: Inter processor communication in UNIX; Design issues in Remote procedure calling; Implementation; **Case Studies**: SUN and ANSA; **Parallel Computing Algorithms**: Various sorting and searching algorithms, performance metrics for parallel algorithm implementations	15

Recommended Books:

1. Vipin Kumar, Ananth Grama, Anshul Gupta and George Karypis Introduction to Parallel Computing, Addison Wesley (2003) 2nd ed.
2. George Coulouris, Jean Dollimore and Tim Kindberg; Distributed Systems Concepts and Design, Addison-Wesley (2000) 3rd ed.
3. S G Akl, The Decision and Analysis of Parallel Algorithms, Prentice Hall (1989).
4. Hwang, Kai, Advanced Computer Architecture: Parallelism, Scalability, Programmability, McGraw Hill (1992).
5. J Jaja, An Introduction to Parallel Algorithms, Addison Wesley (1992).

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	-	1	3	2	-	1	-	-	-	2	1	-	3	2
CO2	1	-	1	-	3	1	-	2	-	-	2	-	2	1	-	-
CO3	-	-	-	2	-	-	2	-	2	3	1	-	-	-	-	3
CO4	-	3	2	-	2	-	-	-	-	2	3	-	-	3	1	1

Program: M.Tech CSE					**Semester:** I		
Course Title: Advanced DBMS Lab					**Course Code:** MTCSE(PT)-151		
L	**T**	**P**	**CH**	**CP**	**Int. A**	**ESE**	**Total**
-	-	2	2	1	30	20	50

Course Description: Working on existing database systems, designing of database, creating relational database, analysis of table design. The lab course also provides practical knowledge to understand advanced database concepts such as Data mining and Big Data Analysis.

Course Outcomes

CO1: Transform an information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS.

CO2: Formulate query, using SQL, solutions to a broad range of query and data update problems.

CO3: Use a desktop database package to create, populate, maintain, and query a database.

CO4: Demonstrate a rudimentary understanding of programmatic interfaces to a database and be able to use the basic functions of one such interface.

Practical **2 Hrs/Week**

Sr No.	Experiment Title
1.	Write relational algebra queries for a given set of relations.
2.	Draw E-R diagram and convert entities and relationships to relation table for a given scenario. a. Two assignments shall be carried out i.e. consider two different scenarios (eg. bank, college)
3.	Perform the following: a. Altering a Table, Dropping/Truncating/Renaming Tables, Backing up / Restoring a Database.
4.	Write a Pl/SQL program using FOR loop to insert ten rows into a database table.
5.	Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, Dept ID) write a cursor to select the five highest paid employees from the table.
6.	Illustrate how you can embed PL/SQL in a high-level host language such as C/Java And demonstrates how a banking debit transaction might be done.
7.	Given an integer i, write a PL/SQL procedure to insert the tuple (i, 'xxx') into a given relation.

CO-PO Mapping

	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO-1	3	3	3	-	-	1	2	-	3	-	3	2	-	-	-	2
CO-2	2	1	-	2	-	-	2	1	-	-	-	-	2	-	-	-
CO-3	-	-	-	-	3	-	-	-	-	2	2	1	-	2	2	2
CO-4	-	-	2	3	-	-	2	-	-	-	-	1	-	-	-	1

1st Year

2 Semester

Program: M.Tech CSE					**Semester:** II		
Course Title: Advanced Data Structures and Algorithms					**Course Code:** MTCSE(PT)-201		
L	**T**	**P**	**CH**	**CP**	**Int. A**	**ESE**	**Total**
4	-	-	4	4	60	40	100

Course Description: This course introduces to a variety of algorithms, approaches to algorithm design, and how they are effectively applied to solve problems in computer science. This course provides material that is more advanced and, in more depth, than an undergraduate data structures course, with a focus on algorithms and analysis. Topics include analysis and design of dynamic programs, greedy algorithms, numerical issues, randomization and NP-Completeness.

Course Outcomes

CO1: Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms.
CO2: Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs.
CO3: Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs.
CO4: Demonstrate different methods for traversing trees.

Theory **4 Hrs/Week**

Unit	Topic	Hours
1	**Review of Elementary Data Structures:** Arrays, linked lists, stacks, queues, binary trees, hashing, graphs, sorting & searching techniques. **Sparse Matrices**: Properties of sparse matrices, Linked list representation of sparse matrices. **Threaded Trees:** Properties of threaded trees, insertion, deletion and traversal.	15
2	**AVL Trees:** Properties of AVL trees, rotations, insertion and deletion. **Red-Black Trees:** Properties of red-black trees, rotations, insertion and deletion. **B-Trees:** Definition of B-trees, basic operations on B-trees, deleting a key from a B-Tree.	15
3	**Heaps**: Properties of Min-max heaps, building a heap, basic operations on heaps, application of min-max heaps. **Binomial heaps**: Binomial tress and binomial heaps, operations on binomial. Fibonacci heaps: Structure of Fibonacci heaps, merge able heap operations, decreasing a key and deleting a node, bounding a maximum degree. **Data Structures for Disjoint Sets**: Disjoint set operations, linked list	10

	representation of disjoint sets, disjoint set forests.	
4	**Graph Algorithms**: Topological sort, minimum Spanning tree, single-source shortest paths, all-pairs shortest paths, bi-connected components, strongly connected components, cycles, articulation points, bridges. **String Matching**: - string-matching algorithm, Rabin-Karp algorithm, String matching with automata, Knuth-Morris-Pratt algorithm, Boyer-Moore algorithm.	20

Recommended Books:

1. Thomas Coremen, Introduction to Algorithms, Second edition, Prentice Hall of India (2007) 2nd ed.
2. Mark Allen Weiss, Data Structures & Algorithm analysis in C, Dorling Kingsley (2002) 3rd ed.
3. Tannenbaum, Augenstein and Langsam, Data Structures using C and C++, Dorling Kingsley (2008) 3rd ed.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	-	1	1	2	1	1	2	3	2	2	1	-	3	2
CO2	-	-	1	-	-	1	-	-	1	-	-	3	2	1	3	2
CO3	3	1	3	-	-	-	2	-	-	3	-	-	1	2	-	-
CO4	2	-	2	-	2	1	-	2	-	2	3	2	-	-	1	1

Program: M.Tech CSE					**Semester:** II		
Course Title: Advanced Computer Architecture					**Course Code:** MTCSE(PT)-202		
L	**T**	**P**	**CH**	**CP**	**Int. A**	**ESE**	**Total**
4	-	-	4	4	60	40	100

Course Description: Architecture and organization of high performance computers. Principles of instruction sets. Pipeline, instruction level parallelism and multi-processors. Memory, storage and interconnection. Quantitative analysis and evaluation of design alternatives. Historical developments. Architectural tradeoffs and innovations.

Course Outcomes

CO1: Understand the Concept of Parallel Processing and its applications.
CO2: Implement the Hardware for Arithmetic Operations.
CO3: Analyze the performance of different scalar Computers.
CO4: Develop the Pipelining Concept for a given set of Instructions.

Theory **4 Hrs/Week**

Unit	Topic	Hours
1	**Overview of von Neumann architecture:** Instruction set architecture; The Arithmetic and Logic Unit, The Control Unit, Memory and I/O devices and their interfacing to the CPU; Measuring and reporting performance; CISC and RISC processors. **Pipelining:** Basic concepts of pipelining, A Pipelined Data path, data hazards, control hazards, and structural hazards; Techniques for reducing the effects of various hazards.	15
2	**Hierarchical Memory Technology:** Inclusion, Coherence and locality properties; write policies, Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, mapping and management techniques, memory replacement policies.	15
3	**Instruction-level parallelism:** Concepts of instruction-level parallelism (ILP), Techniques for increasing ILP; Superscalar, super pipelined and VLIW processor architectures; Vector and symbolic processors.	10
4	**Multiprocessor Architecture:** Taxonomy of parallel architectures; Centralized shared-memory architecture, synchronization, memory consistency, interconnection networks; Distributed shared-memory architecture, Cluster computers. **Non von Neumann Architectures**: Data flow Computers, Systolic Architectures.	20

Recommended Books:

1. W. Stallings, Computer Organization and Architecture: Designing for performance, 4th Ed. PHI, 1996.
2. J. H. Hennessy and D. A. Patterson, Computer Architecture: A Quantitative Approach, 2nd Ed., Morgan Kaufmann, 1996.
3. Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability and Programmability, McGraw-Hill Inc, 1993.
4. D. E. Culler, J. Pal Singh, and A. Gupta, Parallel Computer Architecture: A Hardware/Software Approach, Harcourt Asia Pvt. Ltd., 1999.
5. J. P. Hayes, Computer Architecture and Organization, McGraw Hill.
6. Harvey G. Cragon, Memory Systems and Pipelined Processors, Narosa Publication.
7. V. Rajaraman & C.S.R. Murthy, Parallel Computers, PHI.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO-1	3	2	-	2	-	1	-	2	-	-	-	-	2	-	-	2
CO-2	2	-	-	-	-	2	-	-	-	2	-	1	2	-	-	-
CO-3	3	-	2	2	-	-	-	-	2	-	2	2	-	2	2	-
CO-4	-	-	2	-	2	-	2	-	-	-	3	-	2	-	-	1

Program: M.Tech CSE					**Semester:** II		
Course Title: Advanced Operating System					**Course Code:** MTCSE(PT)-203		
L	**T**	**P**	CH	**CP**	**Int. A**	**ESE**	**Total**
4	0	-	4	4	60	40	100

Course Description: Advanced Operating Systems is a graduate-level course that addresses a broad range of topics in operating system design and implementation, including: Operating system structuring. Synchronization, communication and scheduling in parallel systems.

Course Outcomes

CO1: Describe and explain the fundamental components of a computer operating system.
CO2: Describe and explain the fundamental components of a computer operating system.
CO3: Define, restate, discuss, and explain the policies for scheduling, deadlocks, Memory management, synchronization, system calls, and file systems.
CO4: Describe and extrapolate the interactions among the various components of computing systems.

Theory **4 Hrs/Week**

Unit	Topic	Hours
1	**Review of Operating Systems principles:-** Synchronization mechanisms, Process deadlocks, Architecture of Distributed Operating system: Motivation, System Architecture types, issues in distributed operating system, Communication primitives.	15
2	**Inherent limitations of distributed operating systems**. Event ordering. Timestamps. Distributed mutual exclusion. Token and non-token based algorithms. Comparative performance analysis.	15
3	**Distributed deadlock detection:** Deadlock handling strategies, issues in deadlock detection & re-evaluation, Control Organization: Centralized distributed & Hierarchical detection algorithms.	15
4	**Concurrency control.** Shared Memory. File Systems. Agreement protocols for handling processor failures. Coordination of processes and related algorithms, Interprocess Communications, Failure handling and recovery mechanisms.	15

Recommended Books:

1. Peterson, J.L. & Silbersehatz, A: Operating System Concepts, Addison, Wesley-Reading. . .
2. Brineh, Hansen: Operating System Principles, Prentice Hall of India.
3. Haberman, A.N: Introduction to Operating System Design Galgotia Publication, New Delhi.

4. Hansen, P.B: Architecture of Concurrent Programs, PHI.
5. *5.* Shaw, A.C: Logic Design of Operating Systems, PHI.
6. Mukesh Singhal & N.G. Shivaratri: Advanced concepts in operating systems, TMH 2001.
7. A S Tanenbaum : Modern Operating Systems, PHI.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-
CO2	-	-	-	-	1	-	-	-	2	-	-	-	-	1	-	-
CO3	-	-	-	1	-	-	-	-	-	-	-	2	-	-	-	-
CO4	-	1	-	-	-	-	-	1	-	-	1	-	-	-	2	1

Program: M.Tech CSE					**Semester:** II		
Course Title: Advanced Data Structures and algorithms Lab					**Course Code:** MTCSE(PT)-251		
L	**T**	**P**	**CH**	**CP**	**Int. A**	**ESE**	**Total**
-	-	2	2	1	30	20	50

Course Description: Algorithm design, analysis, classification, optimization, and application. Practice implementing and employing algorithms to solve realistic problems. ... This course provides material that is more advanced and, in more depth, than an undergraduate data structures course, with a focus on algorithms and analysis.

Course Outcomes

CO1: Implement List ADTs and their operations.
CO2: Develop programs for sorting.
CO3: Develop programs for implementing trees and their traversal operations.
CO4: Implement graph traversal algorithms.

Practical **2 Hrs/Week**

Sr No.	Experiment Title
1.	Write a program to perform the following operations on singly linked list. i) Creation ii) Insertion iii) Deletion iv) Traversal.
2.	Write C program that implements the Quick sort method to sort a given list of integers in ascending order.
3.	Write C program that implement the Merge sort method to sort a given list of integers in ascending order.
4.	Write C program that implement the SHELL sort method to sort a given list of integers in ascending order.
5.	Write a program to perform the following: Creating a Binary Tree of integers
6.	Write a program to simulate various graph traversing algorithms.
7.	Write a C program to perform the following: Creating a B-Tree of integers

CO-PO Mapping

	PO1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO-1	3	-	3	-	-	1	2	-	3	-	3	-	2	-	-	2
CO-2	2	1	-	2	-	-	2	1	-	3	-	-	2	-	-	-
CO-3	-	3	-	-	3	-	-	-	3	2	2	1	-	2	2	2
CO-4	-	-	2	3	-	-	2	-	-	-	3	1	-	-	-	1

2nd Year

III Semester

Program: M.Tech CSE					**Semester:** III		
Course Title: Software Verification, Validation & Testing					**Course Code:** MTCSE(PT)-301		
L	**T**	**P**	**CH**	**CP**	**Int. A**	**ESE**	**Total**
4	0	0	4	4	60	40	100

Course Description: Software as a standalone product or embedded within a system plays an integral role in our world today. As a consequence, it is essential that software works as expected. This requires software testing which entails answering both the verification question: "Are we building the product right?" and the validation question: "Are we building the right product?". Understanding these questions is crucial for developing good test cases. This course is for anyone involved in testing software at any level starting from code modules to system testing. Strategies and techniques are presented for testing software as well as planning and tracking testing efforts**.**

Course Outcomes

CO1: Students can assess a software process to evaluate how effective it is at promoting quality.
CO2: Students differentiate the purposes and applicable techniques among the various levels of testing: unit, integration, system, acceptance, usability, and regression testing.
CO3: Students can compute test coverage and yield, according to a variety of criteria.
CO4: Students can explain and apply graph coverage criteria for structural coverage.

Theory **4 Hrs/Week**

Unit	Topic	Hours
1	**Introduction:** What is software testing and why it is so hard?, Error, Fault, Failure, Incident, Test Cases, Testing Process, Limitations of Testing, No absolute proof of correctness, Overview of Graph Theory. **Functional Testing:** Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.	10
2	**Structural Testing:** Path testing, DD-Paths, Cyclomatic Complexity, Graph Metrics, Data Flow Testing, Mutation testing. **Testing Activities:** Unit Testing, Levels of Testing, Integration Testing, System Testing, Debugging, Domain Testing.	15
3	**Reducing the number of test cases:** Prioritization guidelines, Priority category, Scheme, Risk Analysis, Regression Testing, and Slice based testing **Object Oriented Testing:** Issues in Object Oriented Testing, Class Testing, GUI Testing, Object Oriented Integration and System Testing.	20
4	**Testing Tools:** Static Testing Tools, Dynamic Testing Tools, and Characteristics of Modern Tools and Implementation with example.Advanced topics in software testing: web based testing, Client	15

	server testing, Automated test cases generation, Regular expression and FSM based testing.	

Recommended Books:

1. William Perry, Effective Methods for Software Testing , John Wiley & Sons, New York, 1995.
2. Cem Kaner, Jack Falk, Nguyen Quoc, Testing Computer Software , Second Edition, Van Nostrand Reinhold, New York, 1993.
3. Boris Beizer, Software Testing Techniques , Second Volume, Second Edition, Van Nostrand Reinhold, New York, 1990.
4. Louise Tamres, Software Testing , Pearson Education Asia, 2002
5. Roger S. Pressman, Software Engineering – A Practitioner's Approach , Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.

Assessment Process (Internal)

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO2	-	2	-	2	-	3	-	-	-	-	1	-	-	1	-	-
CO3	-	-	1	-	1	-	2	-	-	1	-	2	-	-	2	-
CO4	--	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1

Program: M.Tech CSE					**Semester:** III		
Course Title: Wireless Networks					**Course Code:** MTCSE(PT)-302		
L	**T**	**P**	**CH**	**CP**	**Int. A**	**ESE**	**Total**
4	0	0	4	4	60	40	100

Course Description: This course builds an understanding of the core issues encountered in the design of wireless (vs wired) networks. It also exposes students to fairly recent paradigms in wireless communication.

Course Outcomes

CO1: Understand Cellular communication concepts
CO2: Study the mobile radio propagation
CO3: Study the wireless network different type of MAC protocols
CO4: Study the Channel planning for Wireless Systems

Theory **4 Hrs/Week**

Unit	Topic	Hours
1	**PHYSICAL AND WIRELESS MAC LAYER ALTERNATIVES** Wired transmission techniques: design of wireless modems, power efficiency, out of band radiation, applied wireless transmission techniques, short distance base band transmission, VWB pulse transmission, broad Modems for higher speeds, diversity and smart receiving techniques, random access for data oriented networks, integration of voice and data traffic.	15
2	**WIRELESS NETWORK PLANNING AND OPERATION** Wireless networks topologies, cellular topology, cell fundamentals signal to interference ratio calculation, capacity expansion techniques, cell splitting, use of directional antennas for cell sectoring, micro cell method, overload cells, channels allocation techniques and capacity expansion FCA, channel borrowing techniques, DCA, mobility management, radio resources and power management securities in wireless networks.	20
3	**WIRELESSWAN** Mechanism to support a mobile environment, communication in the infrastructure, IS-95 CDMA forward channel, IS – 95 CDMA reverse channel, pallert and frame formats in IS – 95, IMT – 2000; forward channel in W-CDMA and CDMA 2000, reverse channels in W-CDMA and CDMA-2000, GPRS and higher data rates, short messaging service in GPRS mobile application protocols.	10
4	**WIRELESS LAN** Historical overviews of the LAN industry, evolution of the WLAN industry, wireless home networking, IEEE 802.11. The PHY Layer, MAC Layer, wireless ATM, HYPER LAN, HYPER LAN – 2.	15

	WPAN ANDGEOLOCATION SYSTEMS IEEE 802.15 WPAN, Home RF, Bluetooth, interface between Bluetooth and 802.11, wireless geolocation technologies for wireless geolocation, geolocation standards for E.911 service	

Recommended Books:

1. Kaveh Pahlavan, Prashant Krishnamoorthy, Principles of Wireless Networks, - A united approach - Pearson Education, 2002.
2. Jochen Schiller, Mobile Communications, Person Education – 2003, 2nd Edn.
3. X.Wang and H.V.Poor, Wireless Communication Systems, Pearson education
4. M.Mallick, Mobile and Wireless design essentials, Wiley Publishing Inc.

Assessment Process (Internal)

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO 2	-	2	-	2	-	3	-	-	-	-	1	-	-	1	-	-
CO 3	-	-	1	-	1	-	2	-	-	1	-	2	-	-	2	-
CO 4	--	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1

Program: M.Tech CSE					**Semester:** III		
Course Title: Soft Computing					**Course Code:** MTCSE(PT)-303		
L	**T**	**P**	**CH**	**CP**	**Int. A**	**ESE**	**Total**
4	0	0	4	4	60	40	100

Course Description:

This course will provide students the basic concepts of different methods and tools for processing of uncertainty in intelligent systems, such as, fuzzy models, neural networks, probabilistic models, and foundations of its using in real systems. This course covers main concepts of philosophy of artificial intelligence, hybrid intelligent systems, classification and architecture of hybrid intelligent systems.

Course Outcomes

CO1: Identify and describe soft computing techniques and their roles in building intelligent machines
CO2: Recognize the feasibility of applying a soft computing methodology for a particular problem
CO3: Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems, genetic algorithms to combinatorial optimization problems and neural networks to pattern classification and regression problems
CO4: Effectively use modern software tools to solve real problems using a soft computing approach and evaluate various soft computing approaches for a given problem.

Theory **4 Hrs/Week**

Unit	Topic	Hours
1	**Neural Networks:** History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.	10
2	**Fuzzy Logic:** Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. **Operations on Fuzzy Sets:** Compliment, Intersections, Unions, Combinations of Operations,Aggregation Operations.	20
3	**Fuzzy Arithmetic:** Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Introduction of Neuro-Fuzzy Systems, Architecture of Neuro Fuzzy Networks.	15
4	**Application of Fuzzy Logic:** Medicine, Economics etc. Genetic Algorithm: An Overview of GA, GA operators, GA in problem solving, Implementation of GA**.**	15

Recommended Books:

1. Klir and Yuan, Fuzzy Systems, Prentice Hall (2001).
2. Vijay Lakshmi, Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, Soft Computing Paradigms, Prentice Hall of India (2008).
3. Timothy Ross, Fuzzy Logic, Wiley India (2007) 2nd ed.

Assessment Process (Internal)

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO 2	-	2	-	2	-	3	-	-	-	-	1	-	-	1	-	-
CO 3	-	-	1	-	1	-	2	-	-	1	-	2	-	-	2	-
CO 4	--	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1

Program: M.Tech CSE					**Semester:** III		
Course Title: Software Verification, Validation & Testing Lab					**Course Code:** MTCSE(PT)-351		
L	**T**	**P**	**CH**	**CP**	**Int. A**	**ESE**	**Total**
0	0	2	2	1	30	20	50

Course Description: A LIMS or laboratory information management system is a type of software designed to improve lab productivity and efficiency, by keeping track of data associated with samples, experiments, laboratory workflows, and instruments. ... It's a tool that helps manage efficiency and costs.

Course Outcomes

CO1: Able to understand the history cost of using and building CASE tools.
CO2: Understand the myths and facts of software testing.
CO3: Analyze and design test cases for a white box testing technique which includes path testing, data flow graphs and matrix representation for a given problem.
CO4: Demonstrate the importance of testing and its role in need of software development

Practical **2 Hrs/Week**

Sr No.	Experiment Title
1.	Introduction to UML
2.	Write a programs in C language in demonstration the working of the following constructs i) do..while ii) while..do iii) if…else iv)switch v) for
3.	A program for written in C language for Matrix Multiplication fails‖ introspect the causes for its failure and write down the possible reasons for its failure
4.	Take ATM system and study its system specifications and report various bugs.
5.	Create test plan document for library management system
6.	Study of testing tool (e.g. win runner)
7.	Study of any open source testing tool (e.g. test link)

Assessment Process (Internal)

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	1	-	1	-	1	-	-	-	1	-	1	-	-	-	-
CO2	-	-	-	2	-	-	2	-	-	-	-	-	2	1	-	-
CO3	-	-	1	-	1	-	-	3	-	-	1	-	-	-	1	-
CO4	1	-	-	2	-	-	-	-	1	-	-	-	-	-	-	1

2nd Year

IV Semester

Program: M.Tech CSE					**Semester:** IV		
Course Title: Design of Experiments and Research Methodology					**Course Code:** MTCSE(PT)-401		
L	**T**	**P**	**CH**	**CP**	**Int. A**	**ESE**	**Total**
4	0	0	4	4	60	40	100

Course Description: Research Methodology is a hands-on course designed to impart education in the foundational methods and techniques of academic research in social sciences and business management context.

Course Outcomes

CO1: Understand meaning of research problem and methodology for research.
CO2: Make use of instrumentation for truthful inferences of research.
CO3: Utilize applied statistics in design of experimentation (DOE).
CO4: Develop methodology for the Research Proposal.

Theory **4 Hrs/Week**

Unit	**Topic**	**Hours**
1	Basic principles of design of experiment, Error analysis in experiments Classification of experimental designs, Design and analysis of one factor experiments -Completely randomized and randomized complete block designs, Analysis of variance.	
2	Estimation of parameters, Residual analysis and model checking, Sample size problem. Design with two blocking variables, Latin squares, Analysis of data from a Latin square. Experiment with two factors- Introduction, Main effects and interactions, Two-factor analysis of variance, Graphic analysis, Choice of sample size.	
3	Design of Experiments with the help of orthogonal arrays, Taguchi's Robust parameter design, Analysis, Noise factors, Tolerance on control factors.	
4	Research Methodology – Nature and objective of research, Research topic, Literature review, Formulation of problem, Research design, Sampling techniques, Data collection, Statistical and sensitive analysis of data, Interpretation of result and report writing.	

Recommended Books:

1. Probability and Statistics for Engineers and scientists, Walpole, Myers, Myers and Ye, 7th ed, 2002, Pearson Education.
2. Statistics in Research, Bernand Ostle and Richard N.Mensing 3rd ed, 1975, Oxford & IBH Pub Co.
3. Probability and Statistics in Engineering, Hines, Montgomery, Goldsman and Borror, 4th ed, 2003, John Wiley & Sons.
4. Experimental design, Theory & application, Federer, 1955, Oxford & IBH pub Co.

Assessment Process (Internal)

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO 2	-	2	-	2	-	3	-	-	-	-	1	-	-	1	-	-
CO 3	-	-	1	-	1	-	2	-	-	1	-	2	-	-	2	-
CO 4	--	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1

Program: M.Tech CSE					**Semester:** IV		
Course Title: Cryptography Network Security					**Course Code:** MTCSE(PT)-402		
L	**T**	**P**	**CH**	**CP**	**Int. A**	**ESE**	**Total**
4	0	0	4	4	60	40	100

Course Description: The course is a study of fundamental concepts and principles of computing and network security. The course covers basic security topics, including symmetric and public key cryptography, digital signatures, cryptographic hash functions, authentication pitfalls, and network security protocols.

Course Outcomes
CO1: Understand various Cryptographic Techniques.
CO2: Apply various public key cryptography techniques
CO3: Implement Hashing and Digital Signature techniques
CO4: Understand the various Security Applications

Theory **4 Hrs/Week**

Unit	Topic	Hours
1	**ENCRYPTION AND DECRYPTION :** Attackers and Types of Threats, challenges for information security, Encryption Techniques, Classical Cryptographic Algorithms: Monoalphabetic Substitutions such as the Caesar Cipher, Cryptanalysis of Monoalphabetic ciphers, Polyalphabetic Ciphers such as Vigenere, Vernam Cipher, Stream and Block Ciphers.	15
2	**SYMMETRIC KEY SYSTEMS :** The Data encryption Standard (DES), Analyzing and Strengthening of DES, TDES, Advance Encryption Standard (AES) **KEY MANAGEMENT PROTOCOLS** Solving Key Distribution Problem, Diffie-Hellman Algorithm, Key Exchange with Public Key Crypotography.	15
3	**PUBLIC KEY ENCRYPTION SYSTEMS** Concept and Characteristics of Public Key Encryption system, Introduction to Merkle-Hellman Knapsacks, Rivets – Shamir-Adlman (RSA) Encryption, introduction to Digital Signature Algorithms, The Digital Signature Standard (DSA) **HASHALGORITHMS** Hash concept, description of Hash Algorithms, Message Digest Algorithms such as MD4 and MD5, Secure Hash Algorithms such as SHA1 and SHA2	15
4	**NETWORK SECURITY** Network Security Issues such as Impersonation, Message Confidentiality, Message Integrity, Code Integrity, Denial of Service Attacks, Securing	15

	Switches and Routers, Firewalls, DMZs, Virtual Private Networks, Network Monitoring and Diagnostic Devices, Virtual LANs, IPSec Secure Communication Mechanism, PKI based authentication and Kerberos. **WEB SECURITY** Secure socket Layer Protocol, Pretty Good Privacy, Public Key Cryptography Standards.	

Recommended Books:

1. Principles of Cryptography, William Stallings, Pearson Education.
2. "Security in Computing (Second Edition)" , Charles P.Pfleeger, 1996, Prentice Hall Internation, Inc.
3. Cryptography & Network Security, Atul Kahate, TMH
4. Applied Cryptography: Protocols, Algorithms, and Source Code in C, Bruce Schneier, John Willey and Sons.
5. Firewalls and Internet Security, Bill Cheswick and Steve Bellovin, Addison-Wesley
6. "Security Technologies for the world wide web", Rolf Oppliger, Artech House, Inc.
7. "Digital Certificates Applied Internet Security", Jalal Feghhi and Peter Williams, Addison Wesley Longman, Inc.

8. Experimental design, Theory & application, Federer, 1955, Oxford & IBH pub Co.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	-	-	1	1	-	1	1	-	-	2	2	-	-	-	2
CO2	1	-	1	-	-	1	-	2	-	-	-	-	2	1	-	2
CO3	-	1	-	-	-	-	2	-	2	-	1	2	1	2	-	-
CO4	2	-	2	-	2	1	-	2	-	2	-	-	-	3	1	1

Program: M.Tech CSE					**Semester:** IV		
Course Title: Artificial Intelligence					**Course Code:** MTCSE(PT)-403		
L	**T**	**P**	**CH**	**CP**	**Int. A**	**ESE**	**Total**
4	0	0	4	3	60	40	100

Course Description: The primary objective of this course is to introduce the basic principles, techniques, and applications of Artificial Intelligence. Emphasis will be placed on the teaching of these fundamentals, not on providing a mastery of specific software tools or programming environments. Assigned projects promote a 'hands-on' approach for understanding, as well as a challenging avenue for exploration and creativity.

Course Outcomes

CO1: Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundation
CO2: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
CO3: Demonstrate proficiency developing applications in an 'AI language', expert system shell, or data mining tool.
CO4: Demonstrate proficiency in applying scientific method to models of machine learning.

Theory **4 Hrs/Week**

Unit	**Topic**	**Hours**
1	**Introduction to Artificial intelligence:** Scope, history & applications: AI as representation and search the predicate calculus inference rules. Logic based financial advisor, structures and strategies for state space search graph theory, strategies for space search, using state space to represent reasoning with the predicate calculus. **Heuristic Search:** An algorithm for heuristic search, admissibility monotonicity and informed ness heuristics in games, complexity issues, control and implementation of state space search recursion based search, pattern directed search. Production systems, predicate calculus and planning the black board architecture for problems solving.	15
2	LISP and PROLOG: Knowledge representation languages issues in knowledge representation, network representation language, structured representations, introduction to LISP, Search in LISP: a functional approach to the farmer, Wolf, Goat and cabbage problem, higher order functions & procedural abstraction, search strategies in LIPS.	15
3	**Expert systems:** Introduction, History basic concepts, structure of expert systems, the human element in ES how ES works, problem areas addressed by ES, ES success factors, types of expert systems, ES and the	15

	internet interacts web, knowledge engineering, scope of knowledge, difficulties, in knowledge acquisition methods of knowledge acquisition, machine learning, intelligent agents, selecting an appropriate knowledge acquisition method, knowledge acquisition form multiple experts validation and verification of the knowledge base, analyzing coding, documenting & diagramming.	
4	Expert systems- II, societal impacts reasoning in artificial intelligence, inference with rules, with frames: model based reasoning, case based rezoning, explanation & meta knowledge inference with uncertainty representing uncertainty probabilities and related approaches, theory of certainty (certainty factors) Qualitative reasoning, the development life cycle, phases I, II, III, IV, V, VI the future of expert system development process societal impacts.	15

Recommended Books:

1. Efrain Turban and Jay E Aranson: Decision support systems & intelligent systems (5th Edn.) Prentice hall, 1998.
2. Donald A Waterman: A Guide to expert Systems, Addison -Wesley 1995
3. G.F. Luger & W.A Stubble Field -Artificial Intelligence structures and Strategies for complex problem solving, 3 rd Edn. Addision Wesley 1998.
4. E.Rich and Knight, Artificial Intelligence, Second Edn, Tata Mc. Graw Hill Publishing, 1981.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	-	1	-	1	1	2	-	-	2	-	-	-	2
CO2	1	1	1	1	-	2	-	1	-	-	1	-	-	-	-	2
CO3	3	2	-	1	1	-	-	-	-	-	1	2	2	2	-	-
CO4	-	-	2	-	1	1	1	1	-	1	-	-	-	-	1	1

Program: M. Tech CSE					**Semester:** IV		
Course Title: Artificial Intelligence Lab					**Course Code:** MTCSE(PT)-452		
L	**T**	**P**	**CH**	**CP**	**Int. A**	**ESE**	**Total**
0	0	0	2	1	30	20	50

Course Description: This course teaches what every student should know about Artificial Intelligence. AI is a fast-moving technology with impacts and implications for both our individual lives and society as a whole. In this course, students will get a basic introduction to the building blocks and components of artificial intelligence, learning about concepts like algorithms, machine learning, and neural networks. Students will also explore how AI is already being used, and evaluate problem areas of AI, such as bias. The course also contains a balanced look at AI's impact on existing jobs, as well as its potential to create new and exciting career fields in the future. Students will leave the course with a solid understanding of what AI is, how it works, areas of caution, and what they can do with the technology.

Course Outcomes:

CO1: Elicit, analyze and specify software requirements.
CO2: Understand the implementation procedures for the machine learning algorithms.
CO3: Design Java/Python programs for various Learning algorithms.
CO4: Identify and apply Machine Learning algorithms to solve real word problems.

Practical **2 Hrs/Week**

Sr No.	Experiment Title
1	Study of PROLOG. Write the following programs using PROLOG.
2	Write a program to solve 8 queens problem
3	Solve any problem using depth first search.
4	Solve any problem using best first search.
5	WAP to implement factorial, Fibonacci of a given number.
6	Write a program to solve traveling salesman problem.
7	Write a program to solve water jug problem using LISP.
8	Solve Robot (traversal) problem using means End Analysis.
9	Solve traveling salesman problem.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	1	-	1	1	2	1	-	-	2	-	-	1	-	1	-
CO2	1	2	1	1	-	1	-	2	1	-	2	1	2	2	2	1
CO3	1	-	-	-	-	1	-	-	2	1	-	2	-	1	-	-
CO4	-	3	2	-	1	-	2	-	-	-	2	-	-	-	-	-

3rd Year

V Semester

Course			Periods			Evaluation Scheme					Course Total	
Sr. No	Course Code	Subject	L	T	P	Sessional				Exam	Marks	Credits
						MSE	CA	P	Total	ESE		
(Practical/Training/Project)												
1	MTCSE (PT)-551	Seminar	0	0	4			50	50	-	50	2
2	MTCSE (PT)-552	Dissertation Phase-I	0	0	-			120	120	80	200	6
Total			**8**	**0**	**4**	**80**	**40**	**170**	**290**	**160**	**450**	**16**

3rd Year

VI Semester

Semester VI											Marks	Credits
1	MTCSE(PT)—651	Dissertation Phase-II	0	0	-			300		200	500	20
Total			**0**	**0**	**-**			**300**		**200**	**500**	**20**